The Multidimensional Approach to Measuring Poverty

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Abstract

The current official measurement of poverty published by the Philippine Statistics Authority, which is based on income, does not capture the multidimensional deprivations suffered by Filipinos. This paper discusses a multidimensional poverty index (MPI) for the Philippines using four (4) dimensions with thirteen (13) indicators. These dimensions are education; health and nutrition; housing, water and sanitation; and employment. The Alkire Foster (AF) method in computing multidimensional poverty measures is adopted with nested uniform weights as the weighting scheme and 1/3 as poverty cutoff. Various weighting schemes are also explored in this study - nested inverse incidence and subjective welfare, and other poverty cutoffs are studied: 1/4 and 1/5.

Results reveal that the selection of weighting scheme and poverty cutoff do not greatly affect the trend of the multidimensional poverty measures and the ranks of the dimensions in terms of their contribution to multidimensional poverty.

Keywords: *multidimensional poverty, MPI, poverty, headcount ratio, intensity*

1. Introduction

The Philippine Statistics Authority (PSA) generates official poverty statistics for various stakeholders, especially for development planners and program implementers who address poverty. These poverty statistics are based on income data from the Family Income and Expenditure Survey (FIES) conducted by the PSA. Income-based poverty measures fail to unmask the full picture faced by those living in poverty. Poor people view poverty as a situation beyond income. A more holistic picture of their situation includes access to basic needs like education, health, housing and employment, among others. Balisacan (2015) revealed that economic growth in the Philippines was not reflected in the income-based poverty measures. However, the multidimensional poverty index (MPI) he developed for the country using Alkire Foster (AF) method showed a strong response of

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multidimensional poverty on economic growth. With this, he urged the global community to view poverty at a higher resolution through a multidimensional approach in order to effectively address poverty in all its forms.

AF (2011) are the first to propose a methodology to measure poverty in a multidimensional fashion. Since then, the AF methodology has been the most cited and applied technique in measuring multidimensional poverty. In developing a global MPI, the AF method is applied by the United Nations Development Programme (UNDP) in partnership with the Oxford Poverty and Human Development Initiative (OHPI) which is founded by Sabina Alkire.

As of December 2017, 15 countries have generated official MPI which includes Bhutan and Vietnam for its city-wide (Ho Chi Minh) MPI. Other countries which generate official MPI are Mexico, Colombia, Chile, El Salvador, Ecuador, Pakistan, Honduras, Mozambique, Armenia, Panama, Costa Rica, Dominican Republic and Nepal.

In the Philippines, initiatives on MPI development include the work done by Balisacan (2011) using AF method. The household surveys used as source of data are the National Demographic and Health Survey (NDHS), FIES and Annual Poverty Indicator Survey (APIS). For each survey, MPIs were computed for different periods (1993-2008 for NDHS, 1998-2009 for FIES and 1998-2008 for APIS) using three dimensions and seven NDHS or 10 FIES and APIS indicators depending on the survey used. In the paper of Balisacan, nested uniform weights were used as weighting scheme and different poverty cutoffs were explored. Following the global MPI, included dimensions were health, education, and standard of living.

Another significant endeavor on Philippine MPI was the effort done by Datt (2017) in which he applied the AF method and used APIS data in computing MPI for the years 2004-2013. He explored different weighting schemes such as nested uniform, nested inverse, and subjective welfare weights. Poverty cutoffs were $k = 1/3$, $k = \min\{w_j\}$ and an "inequality-aversion" parameter, $\beta = 1$. He used the same dimensions as the global MPI, and nine and 10 indicators.

Despite these efforts in the past, there is no official MPI yet that has been published for the country. Hence, this paper aims to develop a methodology to measure multidimensional poverty index which will serve as basis in computing official MPI for the Philippines. The development of methodology basically followed the steps and requirements of the AF method. Specifically, the objectives of the study are: 1) to identify relevant dimensions and indicators in measuring multidimensional poverty 2) to compare the proposed weighting scheme and poverty cutoff with selected alternative weights and poverty cutoffs, 3) to evaluate the robustness of the choice of weighting scheme and poverty cutoff, and 4) to develop a Stata program to be used in calculating official multidimensional poverty.

Presented in this research study are the methodology in measuring the current official poverty incidence (Section 2) and the proposed methodology for measuring MPI (Section 3). Also shown are some results (Section 4), and summary, conclusion and recommendations (Section 5).

2. Current Official Poverty Measurement

The current official methodology of measuring poverty is income-based where income data come from the FIES. As presented by Virola (2002), poverty measurement starts with the computation of food threshold which refers to the cost of basic food requirements. These requirements are defined by the Food and Nutrition Research Institute (FNRI) of the Philippines to satisfy 100 percent adequacy for the Recommended Dietary Allowances (RDA) for energy and protein and 80 percent adequacy for the RDA for vitamins, minerals and other nutrients. Non-food basic requirement is also derived based on the expenditure pattern of households within the 10 percentile band around the food threshold. The sum of the cost of the basic nonfood requirement and the food threshold is the poverty threshold.

The official poverty measurement focuses on headcount index in which one measure is the poverty incidence or the proportion of poor families/individuals to total families/individuals. Poor families/individuals are those whose income is below the poverty threshold. Subsistence incidence or food poverty incidence, computed as the proportion of core poor families/individuals to the total families/individuals, is also obtained as measure of poverty. Core poor are those families/individuals whose income is below the food threshold.

3. Methodology for the Multidimensional Poverty Index (MPI)

The measurement of MPI involves the selection of dimensions and indicators, weighting scheme, poverty cutoff (k), and aggregation method. These are presented in this section, along with the other important elements of measuring multidimensional poverty.

3.1. Unit of Analysis

The unit of analysis in the computation of MPI is family since some indicators are unavailable at the individual level. However, the deprivation status of family members follows the deprivation status of their respective families.

3.2. Dimensions and indicators

The initial list of dimensions and indicators was formulated during the workshop on MPI with Dr. Gaurav Datt of World Bank as resource person. The workshop, which was funded by World Bank, was attended by selected staff from the various units/divisions of PSA, namely, Statistical Methodology Unit, Poverty and Human Development Statistics Division, Income and Employment Statistics Division, Demographic and Health Statistics Division, and Census Planning and Coordination Division.

The dimensions and indicators used in the global MPI and initiatives done in the past on Philippine MPI served as the foundations in crafting the dimensions and indicators used in this study. Also considered in the identification of dimensions and indicators were the general principles in formulating indicators identified in the Atkinson Report (2017), practical considerations suitable to the Philippine

setting, commitments in the Sustainable Development Goals and the Philippine Development Plan (PDP), and the aspirations in the "Ambisyon" 2040. The initial list of indicators was revised based on the recommendations of the Inter-Agency Committee on Poverty Statistics. Among the recommendations were: 1) to use underemployment instead of employment in order to capture quality of employment, 2) to replace social protection by health insurance which will be included under Health and Nutrition dimension instead of including it under Employment dimension, and 3) to compare total food consumption, instead of 80 percent of food consumption, with food threshold.

Indicators are all binary for simplicity of identifying deprived and not deprived family/individual. With this, there is no need to set a deprivation cutoff per indicator. For each indicator, the family is assigned a deprivation value of either one or zero and all members of the family follow the deprivation value of their family. At individual level, assignment of deprivation value is shown in equation (1).

$$I_{ij} = \begin{cases} 1 & \text{if person i is deprived of indicator j} \\ 0 & \text{otherwise} \end{cases} \qquad \text{equation (1)}$$

Table 3.1 shows the dimensions, indicators and description of deprivation for each indicator.

Table 3.1. Dimensions, Indicators and Description of Deprivation

Dimension	Indicator	Description (Deprived if…..)
1. **Education**	School Attendance Educational Attainment	• any child in the family aged 5 to 17 years old is not currently attending school • any family member aged 18 years and over did not complete high school
2. **Health and Nutrition**	Hunger Food Consumption Health Insurance	• at least one family member experienced hunger because there was no food to eat at least once in each week during the previous quarter • cost of food consumption is less than food threshold • no family member is a beneficiary/ member/dependent of health insurance program (e.g., Philhealth, private insurances, etc.)

3. **Housing, Water and Sanitation**	Assets	• the family does not own at least one of the communication asset and durables or at least one mobility asset
	Toilet	• the family does not use own flush toilet or closed pit toilet which is not shared with other families
	Water	• source of water supply is not piped into dwelling, yard/plot or protected well
	Tenure	• the family resides in a rent-free house and lot without consent of owner or own house, rent-free lot without consent of owner
	Housing Materials	• roof and wall of the housing unit are made of salvaged or light materials
	Electricity	• there is no electricity in the housing unit
4. **Employment**	Underemployment	• more than 50% of family members who are 18 to 65 years old are not students and underemployed
	Working Children not in School	• any family member 5 to 17 years old is working and not currently attending school

3.3. Weighting Scheme

Weights (w_j) indicate the relative importance of the dimensions and indicators in determining families/individuals who are multidimensionally deprived. The higher the weight of the dimension or indicator, the higher is its importance. As mentioned by Balisacan (2011), there is no "golden rule" to the setting of weights. Weight assignment is a value judgement and is, thus, open to arbitrary simplification. The total weight of the dimensions or indicators is equal to 1 or $\sum_{j=1}^{d} w_j = 1$ where w_j refers to the weight assigned to dimension/indicator j and d is the total number of dimensions/indicators.

a. Proposed Weighting Scheme

In this paper, the proposed weighting scheme is the nested uniform weights. For this weighting scheme, all dimensions have equal weights and all indicators within the dimension have uniform weights which sum up to the weight of the dimension (nested). Weights are nested within the dimension to avoid upward bias which happens when a dimension has more indicators and downward bias for the dimension with lesser indicators. In the global MPI of United Nations Development Programme (UNDP) and in majority of countries adopting MPI as poverty measure, nested uniform weights are commonly used.

b. Alternative Weighting Schemes

Two alternative weighting schemes were compared with the nested uniform weights and these are (1) nested inverse incidence weights and (2) subjective welfare weights.

Nested inverse incidence weights

The weights assigned to deprivation indicators vary inversely with the prevalence of these deprivations in the population (Datt, 2017). These weights are also nested within the dimension to avoid bias caused by the unequal number of indicators per dimension.

Subjective welfare weights

The weights of the indicators are generated from the marginal effects of the indicators to a measure of subjective welfare which is survey-based (Datt, 2017). In the case of this study, the welfare ladder question from the 2004 APIS was used as measure of subjective welfare. The question in the APIS is, "Imagine a ladder with ten steps. The first represents the poorest in society and the tenth represents the richest. On what step of the ladder would you be?" The limitation of using these weights is that the data do not represent the current welfare status of families as they are based on the 2004 APIS. Also, possible presence of multicollinearity among indicators produces high standard errors for the weights (marginal effects) which affect the correctness of multidimensional poverty measures. *Table 3.2* shows the weights of the dimensions and indicators by weighting scheme.

Table 3.2. Weights by Dimension and Indicator, and Weighting Scheme

Dimension	Indicator	Weighting Scheme		
		Nested Uniform	Nested Inverse Incidence*	Subjective Welfare
1. Education	School Attendance	0.125	0.120	0.036
	Educational Attainment	0.125	0.045	0.295
	Total	**0.250**	**0.165**	**0.331**
2. Health and Nutrition	Hunger	0.083	0.085	0.085
	Food Consumption	0.083	0.046	0.085
	Health Insurance	0.083	0.057	0.085
	Total	**0.250**	**0.188**	**0.255**

3. Housing, Water and Sanitation	Assets	0.042	0.024	0.082
	Toilet	0.042	0.031	0.047
	Water	0.042	0.030	0.0003
	Tenure	0.042	0.041	0.049
	Housing Materials	0.042	0.031	0.041
	Electricity	0.042	0.038	0.061
	Total	**0.250**	**0.195**	**0.280**
4. Employment	Underemployment	0.125	0.221	0.067
	Children not in School	0.125	0.232	0.067
	Total	**0.250**	**0.453**	**0.134**

*- 2016 weights

3.4. Poverty Cutoff and Identification of Multidimensionally Poor

a. Poverty Cutoff

Poverty cutoff (k) can range from the minimum weight of the indicators ($\min\{w_j\}$) to 1. When $k=\min\{w_j\}$, the person is considered multidimensionally poor even if he/she is deprived of only one indicator. When k=1, the person is multidimensionally poor if he/she is deprived of all the indicators. In this study, the proposed poverty cutoff follows that of the global MPI where k=3. However, to check robustness of the poverty measures to choice of poverty cutoff, other cutoffs were explored such as 1/4 and 1/5.

b. Identification of Multidimensionally Poor

The identification of multidimensionally poor person starts from the identification of multidimensionally poor family. The deprivation status of the family will automatically be the deprivation status of its family members. If the sum of the deprivation scores of the person is greater than or equal to the poverty cutoff, then the person is considered multidimensionally poor $\left(I_i^{(k)}=1\right)$. That is,

$$I_i^{(k)}=\begin{cases}1 & \text{if } \sum_{j=1}^{d} w_j I_{ij} \geq k \\ 0 & \text{otherwise}\end{cases} \qquad \text{equation (2)}$$

where $I_i^{(k)}$ refers to the multidimensional deprivation status of person i based on poverty cutoff k and $\sum_{j=1}^{d} w_j I_{ij}$ is the sum of the weighted deprivation scores of person i for all indicators.

3.5. Aggregation

a. Multidimensional Poverty Index (MPI)

Aggregation is the process of combining individual weighted deprivations to come up with a single measure of multidimensional poverty which is the MPI. The MPI is computed as follows:

$$M(k) = \frac{1}{n}\sum_{i=1}^{n}\left[\left(\sum_{j=1}^{d} w_j I_{ij}\right) I_i^{(k)}\right] \qquad \text{equation (4)}$$

where M(k) refers to MPI, n is to the total population, w_j is the weight of indicator j, I_{ij} is the deprivation status of person i for indicator j and $I_i^{(k)}$ is the identified multidimensional deprivation status of person i based on the poverty cutoff, k.

With the AF method, the MPI can be expressed as a product of two poverty measures – the Headcount Ratio (H) and the Intensity of Deprivation (A). That is,

$$MPI = H \times A \qquad \text{equation (4a)}$$

b. Headcount Ratio

The headcount ratio (H) is the proportion of multidimensionally poor or the proportion of population who live in poor families. It can be expressed in two ways as follows:

1)

$$H = \frac{q}{n} \qquad \text{equation (5)}$$

where q is the number of multidimensionally poor population and n is the total population.

2)

$$H = \frac{1}{n}\sum_{i=1}^{n} I_i^{(k)} \qquad \text{equation (5a)}$$

c. Intensity of Deprivation

In the official income-based poverty methodology, we can only measure the number of poor families/individuals but not the intensity of their deprivation. The intensity of poverty (A) reflects the proportion of the weighted component indicators in which, on the average, poor people are deprived (Human Development Report, 2016). The intensity of deprivation can be expressed in two forms as follows:

1)

$$A = \frac{\sum_{i=1}^{n} c_i}{q} \qquad \text{equation (6)}$$

where c_i is the sum of the deprivation scores of the multidimensionally poor person and q is the number of multidimensionally poor.

2)

$$A = \frac{\sum_{i=1}^{n}\left[\left(\sum_{j=1}^{d} w_j I_j\right) I_i^{(k)}\right]}{\sum_{i=1}^{n} I_i^{(k)}} \qquad \text{equation (6a)}$$

where notations are the same as in equations (2) and (4).

3.6. Share of each Dimension to MPI

In order to appropriately address poverty, it is important to know not only the level of poverty but the dimension that contributes largely to poverty. Using the AF method, the share of each dimension in MPI can be obtained which is not possible in the income-based poverty measurement. The share of each dimension (D) to MPI in percentage can be obtained using the following:

$$\text{Contribution}_D = \frac{1}{\text{MPI}}\left\{\sum_{j\in D}\left[\sum_{i=1}^{n}\left(w_j I_{ij}\right) I_i^{(k)}\right]\right\} x100 \qquad \text{equation (7)}$$

where D refers to the dimension.

3.7. Data Source, Survey Weights and Measures of Precision

All indicators can be obtained from the APIS, except for employment and underemployment, which are available in the Labor Force Survey (LFS). Because of this, the dataset used in the study is the merged APIS and LFS dataset. The years covered in the analysis were 2013, 2014 and 2016. There was no 2015 data since APIS is not conducted in years when there is FIES. The FIES is conducted every three years, in which the latest available data is 2015. For comparability with 2013 and 2014 merged APIS and LFS data, the 2016 merged data used was based from the old (2003) Master Sample (MS) design since the 2013 and 2014 APIS and LFS adopted the old MS design.

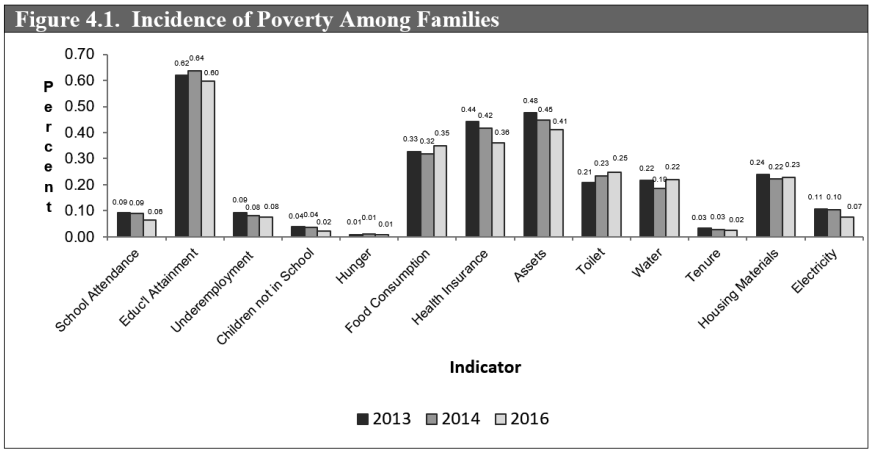
Adjusted survey weights of the APIS, which was the main source of data, were applied to all estimations done in this study. Measures of precision used were standard errors (SEs) and coefficient of variations (CVs). SEs were approximated using Taylor Linearization Method.

4. Results and Discussion

4.1. Incidence of Poverty

Of the 13 indicators, the highest deprivation was noted in educational attainment with incidence of about 60 percent of the total families for the years covered in this study. This implies that majority of the families had members who were 18 years old but did not complete high school education. Came next was the lack of assets for communication and mobility, and on durables with incidence of 41 to 48 percent for 2013, 2014 and 2016. The least was hunger with an incidence of about one percent. This means that only a few families had members who experienced hunger because there was no food to eat, at least once in each week. Except for food consumption, toilet and water, incidence of deprivation in all indicators went down from 2013 to 2016. *Figure 4.1* shows the proportion of families who were deprived of the indicators by year.

Figure 4.1. Incidence of Poverty Among Families



4.2. Annual Rate of Change of Poverty

Viewing poverty from a multidimensional perspective provides deeper and more useful information on the situation of poor people in the country. While there was a reduction of poverty in the country from the official income-based poverty measure, it was not reflective of the economic growth that the country had experienced (Baliscan, 2011 and Datt, 2017). Using the multidimensional poverty approach, the proposed weighting scheme (nested uniform weights) and poverty cutoff (1/3) yielded a faster rate of poverty reduction of 6.8 percent annually, on the average, from 2013 to 2016 than the official poverty measure

which decreased at an average of 5.9 percent annually from 2012 to 2015. For the alternative weighting schemes, multidimensional poverty decreased at an average annual rate ranging from eight percent to 11 percent using nested inverse weights and around three percent for subjective welfare weights from 2013 to 2016. Note that the source of the official poverty incidence is FIES which is conducted every three years and the latest available data is 2015. Hence, data on official poverty incidence are not available for years 2013 and 2014.

Based from the studies done by Balisacan (2011) and Datt (2017) using APIS data, average annual rate of decrease of multidimensional poverty was 2.8 percent from 1998 to 2008 and 1.6 percent from 2004 to 2013, respectively. Note, however, that indicators used by Balisacan (2011) and Datt (2007) were not exactly the same as the indicators used in this study. *Table 4.1* presents the MPI and the average annual percent change of MPI by weighting scheme and poverty cutoff.

Table 4.1. MPI and Average Annual Percent Change of MPI

Poverty Cutoff	Year	Weighting Scheme		
		nested uniform	nested inverse incidence	subjective welfare
k = 1/3	2013	0.142	0.057	0.296
	2014	0.133	0.050	0.290
	2016	0.113	0.039	0.266
Average Annual Change (%)	(2013-2016)	-6.808	-10.526	-3.378
k=1/4	2013	0.188	0.079	0.326
	2014	0.179	0.073	0.327
	2016	0.160	0.056	0.301
Average Annual Change (%)	(2013-2016)	-5.034	-9.705	-2.556
k=1/5	2013	0.209	0.096	0.330
	2014	0.200	0.090	0.330
	2016	0.183	0.074	0.305
Average Annual Change (%)	(2013-2016)	-4.086	-7.639	-2.525

4.3. Choice of Weights: Nested Uniform Weights versus Alternative Weights

a. MPI, Headcount Ratio and Intensity of Deprivation: National Level

The proposed weighting scheme is the nested uniform weights for simplicity and for uniformity with the weighting scheme used in the global MPI. The alternative weighting schemes used in this study were nested inverse and subjective welfare.

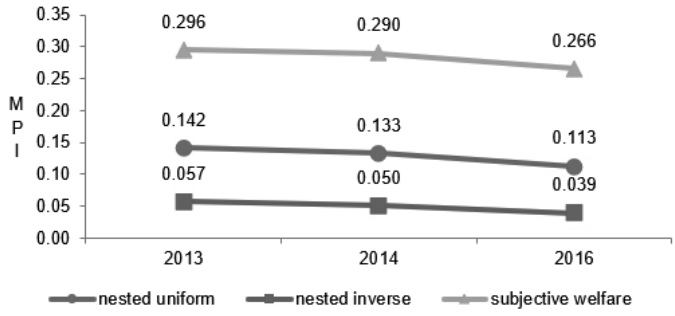
The choice of weighting scheme did not affect the trends of MPI, headcount ratio and intensity of deprivation. With a fixed deprivation cutoff of 1/3, uniform

weights and the two alternative weighting schemes all showed downward trends for the three poverty measures. However, in terms of levels, the three weighting schemes produced different values of MPI, headcount ratio and intensity of deprivation. MPI and headcount ratio using uniform weights were consistently at the middle of the values using the two alternative weighting schemes with nested inverse weights being the lowest. In terms of intensity of deprivation, uniform weights consistently produced the lowest values for 2013, 2014 and 2016.

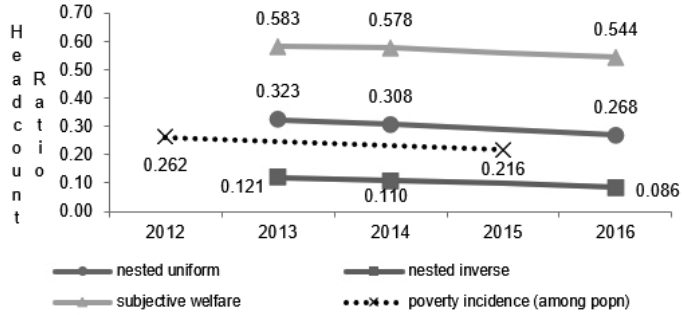
Comparing the official poverty incidence with the headcount ratio, official poverty incidence displayed similar downward pattern as the headcount ratios obtained from the different weighting schemes with nested uniform weights as the closest to the official poverty incidence. *Figure 4.2* shows the MPI, headcount ratio and intensity of deprivation by weighting scheme with poverty cutoff of 1/3.

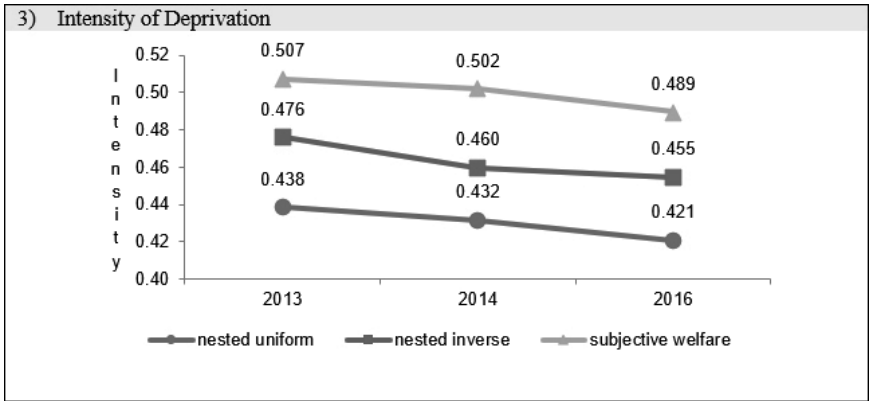
Figure 4.2. MPI, Headcount Ratio (H) and Intensity of Deprivation (H) Using 1/3 as Poverty Cutoff by Weighting Scheme

1) MPI



2) Headcount Ratio





b. MPI, Headcount Ratio and Intensity of Deprivation: Regional Level

In each poverty measure, the regional ranks were compared by weighting scheme to further check robustness of the choice of weights. *Figure 4.3* shows the results of the ranking by weighting scheme using 2016 data and 1/3 poverty cutoff.

For 2016 MPI, the weighting schemes were consistent in their ranks for three regions, namely, Region XII (rank 2), Region VII (rank 10) and NCR (rank 17). Nested uniform and subjective welfare weights yielded ranks that were almost similar for all regions. For these two weighting schemes, nine regions had the same ranks while the rest had differences of one or two levels, except for Caraga which had a difference of four. The ranks from the nested inverse weights were not too different from the two weighting schemes, except for some regions where strong deviations were noted. Discrepancies in ranks with a range from six to 13 were observed in the following regions: CAR, ARMM and Regions III, VI and IX.

For the 2016 headcount ratio, ranks from the three weighting schemes were consistent for NCR and region IV-A. As in MPI, nested uniform and subjective welfare weights yielded ranks that were almost consistent for all regions. For these two weighting schemes, seven regions had the same ranks while the differences in ranks for the rest of the regions ranged from one to three steps. Ranks of regional headcount ratio from the nested inverse weights yielded strong deviations from the other two weighting schemes for the same regions observed in the 2016 MPI. Comparing the 2016 headcount ratio with the official poverty incidence among population in 2015, ranks of NCR and region IV-A were consistent for both poverty measures and in all weighting schemes used for the headcount ratio. Among the weighting schemes, the nested uniform produced more regions that had consistent or nearly consistent ranks with the official poverty incidence.

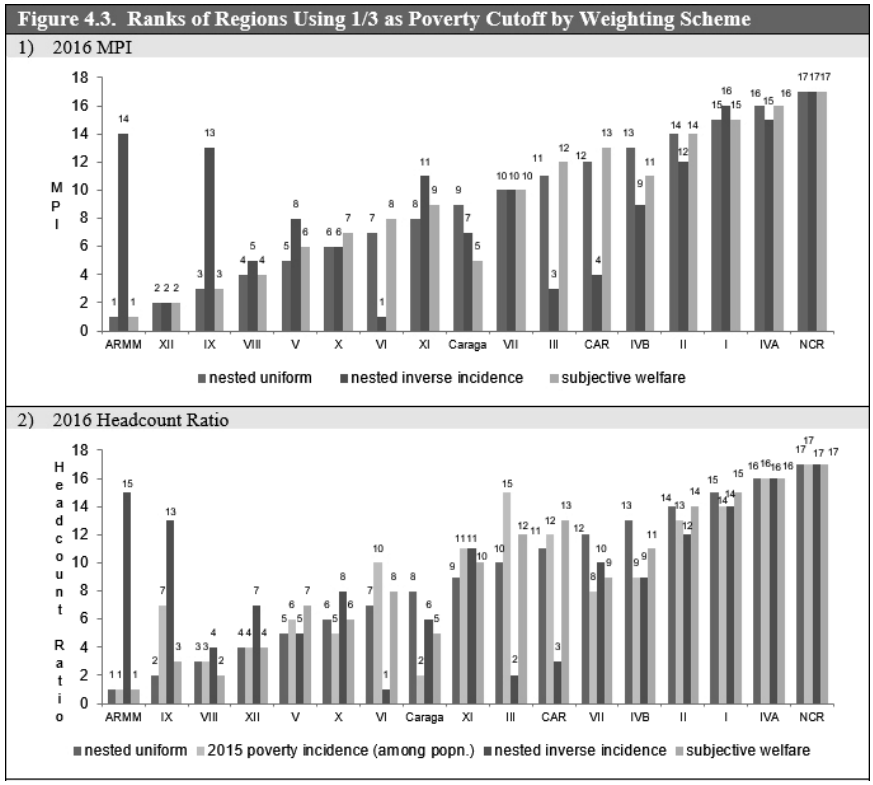
For intensity of deprivation, ARMM and region XII had the same ranks in all the weighting schemes. Ranks for NCR; and regions VIII, XI and XII were nearly consistent for all weighting schemes and the rest of the regions had wide variations in their ranks across weighting schemes.

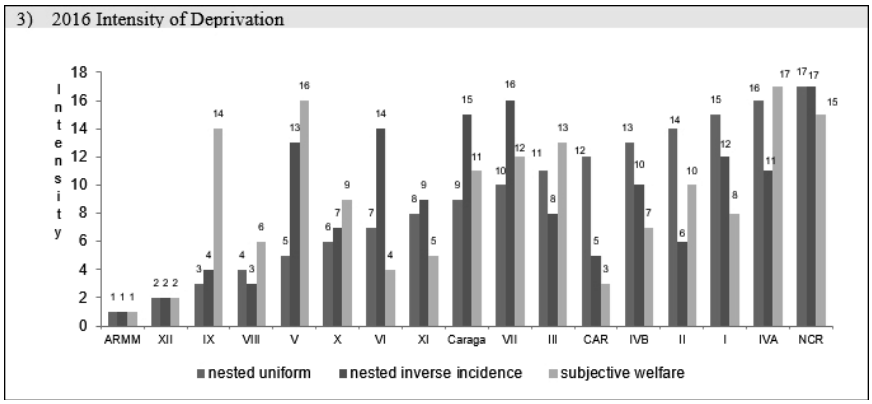
c. Share of each Dimension to MPI: National Level

The MPI does not only provide information on the number of poor and the intensity of their deprivation but also the dimensions where poor people are deprived.

Shares of the four dimensions to MPI vary by weighting scheme. However, ranks of the dimensions in terms of percent share to 2016 MPI were the same for nested uniform and subjective welfare weights. Both weighting schemes had education as the main contributing factor to multidimensional poverty. Next to education were health and nutrition; housing, water and sanitation; and employment, in that order. On the other hand, nested incidence displayed a different picture in which employment had the highest share to MPI, and health and nutrition had the lowest. *Figure 4.4* shows the percent share of each dimension in the 2016 MPI by weighting scheme with 1/3 as poverty cutoff.

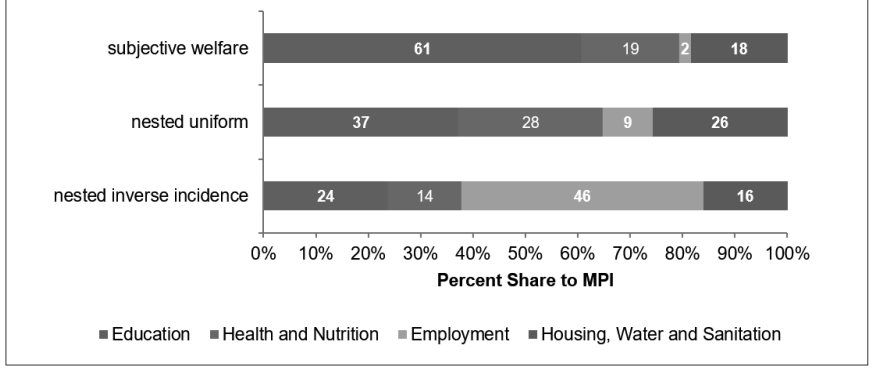
Figure 4.3. Ranks of Regions Using 1/3 as Poverty Cutoff by Weighting Scheme





Notes:
1) The region with the highest value is assigned a rank of 1
2) Arrangement of regions is based on their ranks using nested uniform weights

Figure 4.4. Percent Share of each Dimension to MPI using 1/3 as Poverty Cutoff by Weighting Scheme: 2016



At the regional level, percent shares of the dimensions to MPI were also different for the three weighting schemes. However, for NCR and Region I, education was consistently the highest regardless of weighting scheme used. For the rest of the regions, education was the highest for the nested uniform and subjective welfare weights while employment was the highest for nested inverse incidence weights. *(Appendix 5)*

4.4. Choice of Poverty Cutoff (k): 1/3 versus Alternative Poverty Cutoffs

a. MPI, Headcount Ratio and Intensity of Deprivation: National Level

The proposed poverty cutoff is 1/3 for consistency with the global MPI. The other cutoff explored in this study were 1/4 and 1/5. To compare the three cutoffs, the weighting scheme was fixed to nested uniform. *Figure 4.5* shows the graphs of

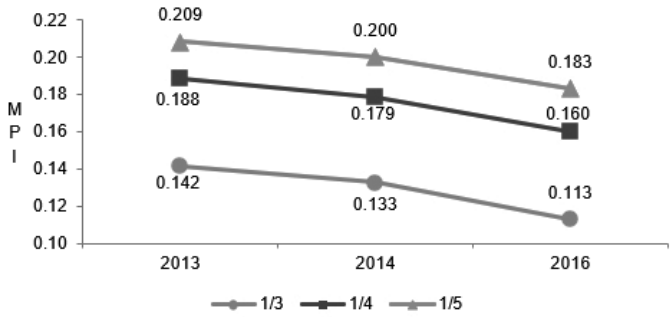
MPI, headcount ratio, and intensity of deprivation using nested uniform weights by poverty cutoff.

The choice of poverty cutoff did not affect the trends of MPI, headcount ratio, and intensity of deprivation. Using a fixed weighting scheme, which is nested uniform, all the poverty cutoffs showed downward trends for the three poverty measures. Expectedly, the three poverty cutoffs did not yield equal values as higher poverty cutoff tends to produce lower number of multidimensionally poor which is directly affecting the MPI and headcount ratio, but inversely affecting the intensity of deprivation. Hence, for 1/3 cutoff, which is more relaxed than 1/4 and 1/5 cutoffs, MPI and headcount ratio were the lowest but the highest in terms of intensity of deprivation.

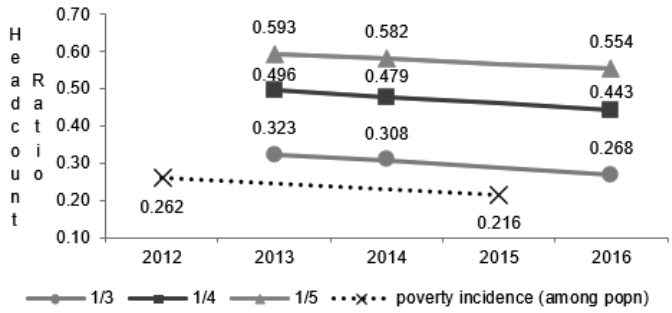
Poverty measure in terms of the official poverty incidence was similarly on downtrend from 2012 to 2015 as the headcount ratios from 2013 to 2016 regardless of the poverty cutoff used. The closest to the official poverty incidence was the headcount ratio using 1/3 as poverty cutoff.

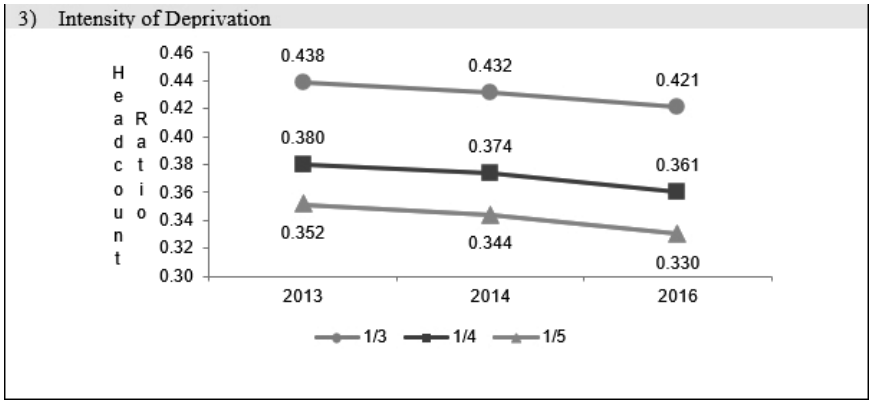
Figure 4.5. MPI, Headcount Ratio (H) and Intensity of Deprivation (H) using Nested Uniform Weights by Poverty Cutoff

1) MPI



2) Headcount Ratio





b. MPI, Headcount Ratio and Intensity of Deprivation: Regional Level

In each poverty measure, the regional ranks were compared by poverty cutoff to further check robustness of the choice of cutoff. *Figure 4.6* shows the results of the ranking using 2016 data and nested uniform weights.

For 2016 MPI, the poverty cutoffs were consistent in their ranks for five regions, namely, ARMM (rank 1), Region II (rank 14), Region I (rank 15), IV-A (rank 16), and NCR (rank 17). For the rest of the regions, differences in ranks ranged from 1 to 5.

For the 2016 headcount ratio, six regions were consistent in their ranks for the three poverty cutoffs. These were ARMM (rank 1), Region XII (Rank 4), Region X (rank 6), region VII (rank 12), Region IV-A (rank 16), and NCR (rank 17). Comparing the 2016 headcount ratio with the official poverty incidence among population in 2015, ranks of regions using the official poverty incidence were consistent with the three poverty cutoffs in four regions, namely, ARMM, Region XII, Region IV-A, and NCR.

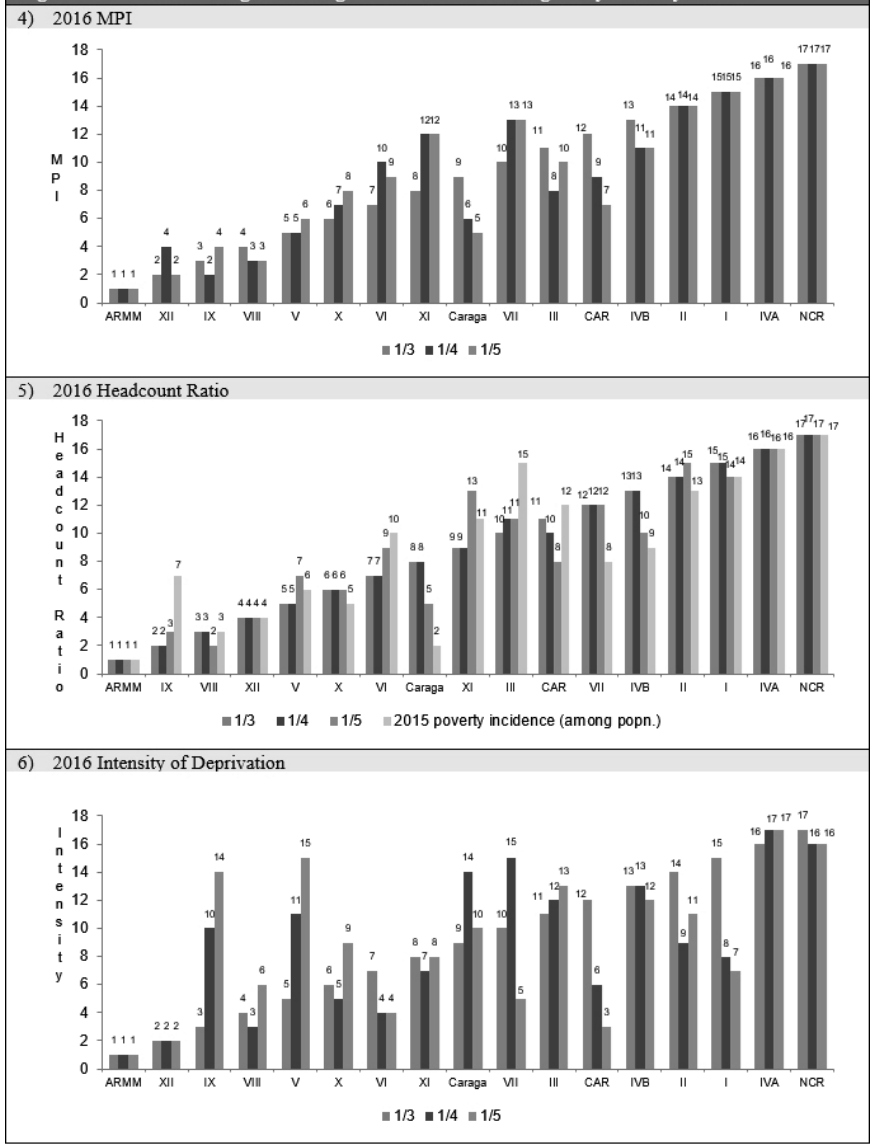
In terms of intensity of deprivation, only ARMM (rank 1) and region II (rank 2) were consistent in ranks for the three poverty cutoffs. Wide variation of ranks was noted in most of the regions.

c. Share of each Dimension to MPI

The choice of poverty cutoff does not affect the ranks of the dimensions in terms of their shares to MPI. For all poverty cutoffs, the highest contributor to multidimensional poverty in 2016 was education, followed by health and nutrition, and the least was employment. As poverty cutoff becomes stricter (lower value), shares of education; and health and nutrition tend to increase while shares of employment; and housing, water and sanitation tend to go down. *Figure 4.7* shows the percent share of each dimension to MPI by different weighting scheme with 1/3 as poverty cutoff.

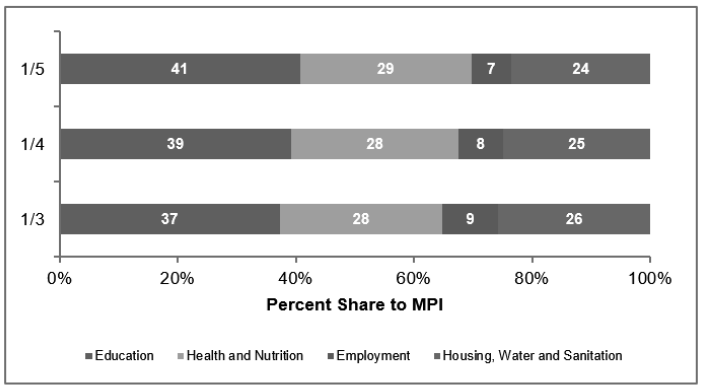
Different poverty cutoffs also yielded different percent shares of the dimensions to MPI for the regions. However, ranks of the dimensions were unaffected by the poverty cutoff used where education was the highest and employment was the lowest. *(Appendix 6)*

Figure 4.6. Ranks of Regions Using Nested Uniform Weights by Poverty Cutoff



Notes:
1) *The region with the highest value is assigned a rank of 1*
2) *Arrangement of regions is based on their ranks using nested uniform weights*

Figure 4.7. Percent Share of each Dimension to MPI using Nested Uniform Weights by Poverty Cutoff; 2016



5. Summary, Conclusion and Recommendations

5.1. Summary of Findings

Viewing poverty at higher resolution through the lens of multidimensional approach can provide a comprehensive picture of the situation of those living in poverty. It provides rich information to effectively address the areas where people are deprived. From the results discussed above, the following are the conclusions and recommendations:

a. Trends of MPI, headcount ratio, and intensity of deprivation are robust to the choice of weighting scheme and poverty cutoff. However, their levels are sensitive to the choice of weighting scheme and poverty cutoff.

b. Ranks of the dimensions in terms of percent share to MPI are consistent for nested uniform weights and subjective welfare weights in which education is the main contributory to multidimensional poverty among poor. This implies that poverty reduction interventions need to focus on education as this is the main contributing factor to multidimensional poverty among poor. In terms of the choice of poverty cutoff, ranks of the dimensions are unchanged as poverty cutoff changes.

c. Regional ranks in terms of MPI, headcount ratio, and intensity of deprivation are consistent for some regions regardless of the weighting scheme and poverty cutoff used. The rest of the regions have varying ranks depending on the choice of weighting scheme and poverty cutoff.

d. Headcount ratios using nested uniform weights and 1/3 poverty cutoff are consistently the closest to the official poverty incidence.

e. In terms of precision of poverty measures, CVs are low for all weighting schemes indicating reliability of these estimates.

5.2. Conclusion

The proposed methodology for the Philippine MPI has four dimensions and 13 indicators, and uses nested uniform weights as weighing scheme with 1/3 as poverty cutoff. Using the Stata program developed by the authors, the proposed methodology is capable of producing the needed estimates to describe multidimensional poverty in the country. It may not be the most appropriate methodology for now as choice of indicators is limited only to what is currently available, it is, however, a good starting point to generate multidimensional poverty measures that complement the official income-based poverty incidence published by the PSA. These multidimensional poverty measures will provide policy makers bases to better address the needs of those in poverty.

5.3. Recommendations

The following are recommended for further investigation and future works.

a. Formal test of robustness as test done to check robustness of the choice of weighing scheme and poverty cutoff was through the analysis of graphs, and differences in levels and ranks only.

b. Revision of the Stata program to consider generation of multidimensional poverty measures by specific group such as presence of children, male-headed families, among others and consider testing robustness of weighing scheme and poverty cutoff for each group.

c. Conduct of a research study to determine the best method for adjusting the survey weights of the merged LFS and APIS/FIES data which is the dataset used in generating MPI.

d. Continuously conduct a research study to improve the methodology for MPI especially the selection of indicators to measure multidimensional poverty.

References

ALKIRE, S. and J.E. FOSTER. (2011). Counting and Multidimensional Poverty Measurement, Journal of Public Economics, 95(7-8): 476-487.

ALKIRE, S. and J. FOSTER (2011), "Acute Multidimensional Poverty Measurement: A New Index for Developing Countries, OHPI Working Paper No. 38, University of Oxford.

ALKIRE S., FOSTER, J.E., SETH, S., SANTOS, M.E., ROCHE, J.M., and P. BALLON. (2015), Multidimensional Poverty Measurement and Analysis. Oxford University Press, Oxford.

ATKINSON, (2017), Monitoring Global Poverty, Human Development Report 2010, New York.

BALISACAN, A.M. (2011), What Has Really Happened to Poverty in the Philippines? New Measures, Evidence, and Policy Implications, UPSE Discussion Paper No. 2011-14, University of the Philippines, http://www.mppn.org.

BALISACAN, A.M. (2015), The Growth-Poverty Nexus: Multidimensional Poverty in the Philippines, Chapter 24 in Balisacan, Arsenio M., Chakravorty, Ujjayant and Majah-Leah V. Ravago (eds.). Sustainable Economic Development: Resources, Environment, and Institutions. Academic Press. Oxford.

DATT, G. (2017), Multidimensional Poverty Index in the Philippines, 2004-20013, Do Choices for Weighting, Identification and Aggregation Matter? Policy Research Working Paper, World Bank.

VIROLA, R. (2002), Statistical Challenges on Poverty Reduction in the Philippines, Paper presented in the Regional Seminar for Asian Managers on Monitoring and Evaluation of Poverty Reduction Program.

Appendices

Appendix 1. MPI, Headcount Ratio (H) and Intensity (A) by Weighting Scheme and Poverty Cutoff (k)

Nested Uniform Weights										
Poverty Cutoff (k)	Year	MPI			Headcount Ratio (H)			Intensity (A)		
		Estimate	SE	CV (%)	Estimate	SE	CV (%)	Estimate	SE	CV (%)
k=1/3	2013	0.142	0.002	1.733	0.323	0.005	1.643	0.438	0.002	0.488
	2014	0.133	0.002	1.825	0.308	0.005	1.748	0.432	0.002	0.501
	2016	0.113	0.002	1.876	0.268	0.005	1.794	0.421	0.002	0.480
k=1/4	2013	0.188	0.002	1.258	0.496	0.006	1.136	0.380	0.002	0.510
	2014	0.179	0.002	1.316	0.479	0.006	1.199	0.374	0.002	0.512
	2016	0.160	0.002	1.328	0.443	0.005	1.227	0.361	0.002	0.486
k=1/5	2013	0.209	0.002	1.083	0.593	0.006	0.930	0.352	0.002	0.536
	2014	0.200	0.002	1.119	0.582	0.006	0.969	0.344	0.002	0.537
	2016	0.183	0.002	1.110	0.554	0.005	0.988	0.330	0.002	0.512
Nested Incidence Weights										
Poverty Cutoff (k)	Year	MPI			Headcount Ratio (H)			Intensity (A)		
		Estimate	SE	CV (%)	Estimate	SE	CV (%)	Estimate	SE	CV (%)
k=1/3	2013	0.057	0.002	3.289	0.121	0.004	3.140	0.476	0.004	0.809
	2014	0.050	0.002	3.497	0.110	0.004	3.368	0.460	0.004	0.810
	2016	0.039	0.001	3.740	0.086	0.003	3.597	0.455	0.004	0.827
k=1/4	2013	0.079	0.002	2.517	0.196	0.005	2.328	0.402	0.003	0.860
	2014	0.073	0.002	2.605	0.188	0.005	2.439	0.386	0.003	0.850
	2016	0.056	0.002	2.847	0.144	0.004	2.680	0.387	0.003	0.866
k=1/5	2013	0.096	0.002	2.083	0.274	0.005	1.852	0.352	0.003	0.871
	2014	0.090	0.002	2.134	0.267	0.005	1.918	0.337	0.003	0.854
	2016	0.074	0.002	2.227	0.226	0.005	2.011	0.327	0.003	0.870
Subjective Welfare Weights										
Poverty Cutoff (k)	Year	MPI			Headcount Ratio (H)			Intensity (A)		
		Estimate	SE	CV (%)	Estimate	SE	CV (%)	Estimate	SE	CV (%)
k=1/3	2013	0.296	0.003	0.998	0.583	0.006	0.950	0.507	0.002	0.311
	2014	0.290	0.003	1.028	0.578	0.006	0.978	0.502	0.002	0.315
	2016	0.266	0.003	1.043	0.544	0.005	1.007	0.489	0.001	0.302
k=1/4	2013	0.326	0.003	0.825	0.688	0.005	0.745	0.475	0.002	0.362
	2014	0.327	0.003	0.811	0.702	0.005	0.726	0.465	0.002	0.373
	2016	0.301	0.003	0.841	0.664	0.005	0.776	0.454	0.002	0.353
k=1/5	2013	0.330	0.003	0.805	0.704	0.005	0.716	0.468	0.002	0.373
	2014	0.330	0.003	0.795	0.716	0.005	0.702	0.460	0.002	0.381
	2016	0.305	0.003	0.819	0.682	0.005	0.745	0.448	0.002	0.364

Appendix 2. Percent Shares of Dimensions to MPI by Weighting Scheme and Poverty Cutoff

Nested Uniform Weights					
Poverty Cutoff	**Year**	**Education**	**Health and Nutrition**	**Employment**	**Housing, Water and Sanitation**
k = 1/3	2013	37.59	26.78	11.08	24.56
	2014	38.23	26.96	10.26	24.56
	2016	37.23	27.57	9.47	25.73
k = 1/4	2013	39.36	27.56	9.16	23.92
	2014	40.22	27.60	8.46	23.71
	2016	39.22	28.31	7.54	24.93
k = 1/5	2013	40.48	28.19	8.46	22.88
	2014	41.57	28.13	7.74	22.56
	2016	40.68	29.02	6.80	23.50
Nested Inverse Incidence Weights					
Poverty Cutoff	**Year**	**Education**	**Health and Nutrition**	**Employment**	**Housing, Water and Sanitation**
k = 1/3	2013	23.30	13.74	47.28	15.68
	2014	22.25	14.93	46.28	16.54
	2016	23.75	14.05	46.09	16.10
k = 1/4	2013	24.54	16.61	40.66	18.19
	2014	22.67	18.00	38.62	20.72
	2016	24.58	16.57	40.41	18.44
k = 1/5	2013	24.93	18.66	35.15	21.26
	2014	22.82	21.27	32.57	23.34
	2016	24.83	20.40	32.24	22.53
Subjective Welfare Weights					
Poverty Cutoff	**Year**	**Education**	**Health and Nutrition**	**Employment**	**Housing, Water and Sanitation**
k = 1/3	2013	58.81	18.91	2.93	19.35
	2014	59.53	18.70	2.62	19.15
	2016	60.76	18.59	2.24	18.41
k = 1/4	2013	61.12	17.91	2.74	18.23
	2014	62.75	17.22	2.40	17.63
	2016	63.52	17.33	2.05	17.09
k = 1/5	2013	60.46	18.19	2.77	18.58
	2014	62.21	17.45	2.41	17.94
	2016	62.73	17.71	2.06	17.50

Appendix 3. MPI, Headcount Ratio (H) and Intensity (A) Using Nested Uniform Weights and 1/3 Poverty Cutoff (k) by Region: 2016

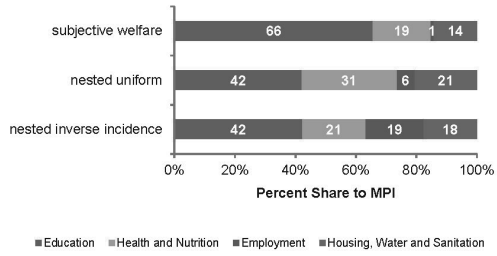
Nested Uniform Weights, k= 1/3									
Region	MPI			Headcount Ratio (H)			Intensity (A)		
	Estimate	SE	CV (%)	Esti-mate	SE	CV (%)	Esti-mate	SE	CV (%)
NCR	0.036	0.004	10.862	0.088	0.009	10.372	0.407	0.010	2.544
CAR	0.133	0.011	6.145	0.317	0.025	5.908	0.419	0.008	1.894
I	0.075	0.007	6.057	0.188	0.018	5.756	0.396	0.008	1.936
II	0.084	0.009	6.470	0.196	0.019	6.088	0.432	0.013	2.909
III	0.133	0.011	5.624	0.317	0.025	5.317	0.419	0.008	1.894
IVA	0.060	0.005	7.200	0.141	0.012	6.861	0.426	0.008	1.975
IVB	0.130	0.012	6.861	0.313	0.027	6.574	0.417	0.010	2.389
V	0.155	0.009	5.931	0.368	0.022	5.569	0.420	0.007	1.640
VI	0.143	0.009	0.000	0.342	0.020	0.000	0.419	0.007	1.713
VII	0.134	0.009	10.862	0.317	0.019	10.372	0.422	0.007	1.749
VIII	0.172	0.010	6.145	0.419	0.022	5.908	0.410	0.007	1.610
IX	0.178	0.011	6.057	0.426	0.025	5.756	0.418	0.008	1.832
X	0.143	0.010	6.470	0.345	0.024	6.088	0.416	0.009	2.138
XI	0.139	0.010	5.624	0.323	0.021	5.317	0.431	0.008	1.848
XII	0.184	0.011	7.200	0.417	0.023	6.861	0.441	0.008	1.908
Caraga	0.138	0.010	6.861	0.330	0.024	6.574	0.418	0.008	1.946
ARMM	0.262	0.013	5.931	0.594	0.028	5.569	0.441	0.006	1.263

Appendix 4. Percent Shares of Dimensions to MPI Using Nested Uniform Weights and 1/3 Poverty Cutoff by Region

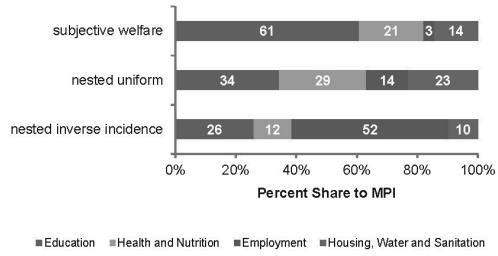
Region	Education	Health and Nutrition	Employment	Housing, Water and Sanitation
NCR	42.06	31.41	5.91	42.06
CAR	34.39	28.68	13.94	34.39
I	43.78	29.61	8.86	43.78
II	38.81	32.55	12.67	38.81
III	34.39	28.68	13.94	34.39
IVA	42.48	25.95	9.69	42.48
IVB	35.68	25.52	9.98	35.68
V	35.16	24.58	11.07	35.16
VI	33.58	24.92	14.28	33.58
VII	37.77	28.45	7.67	37.77
VIII	36.02	27.34	10.50	36.02
IX	36.58	25.97	5.47	36.58
X	37.22	26.75	12.34	37.22
XI	35.15	26.29	7.16	35.15
XII	34.45	28.16	9.16	34.45
Caraga	37.50	23.93	14.55	37.50
ARMM	22.25	14.93	46.28	16.54

Appendix 5. Percent Share of each Dimension to MPI using 1/3 Poverty Cutoff by Weighing Scheme and Region: 2016

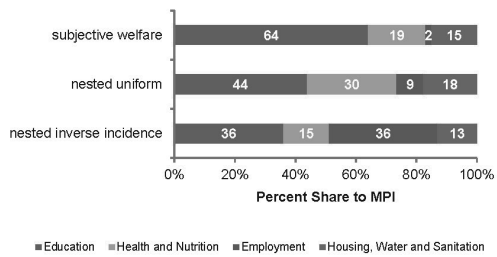
NCR



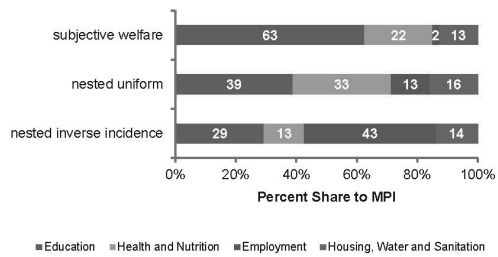
CAR



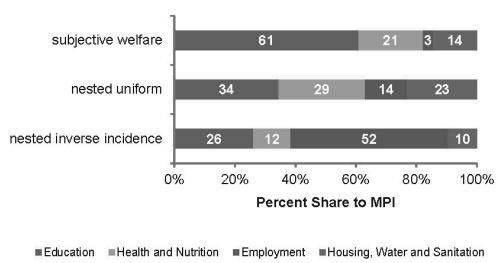
Region I



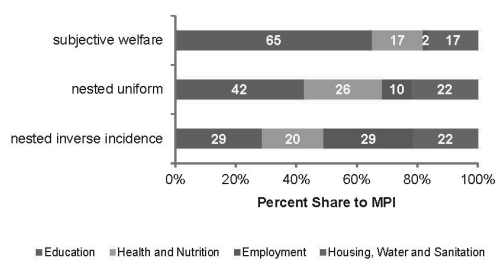
Region II



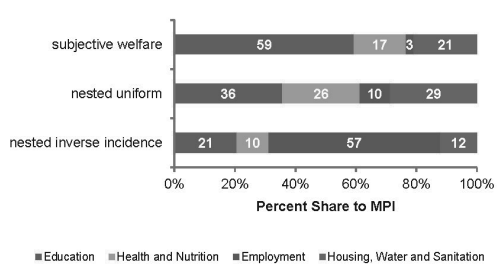
Region III



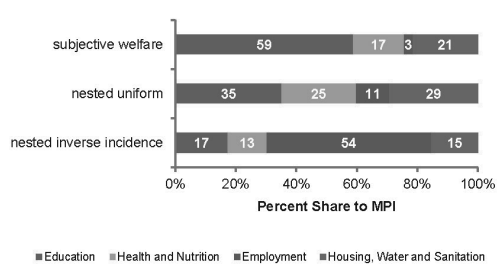
Region IVA



MIMAROPA

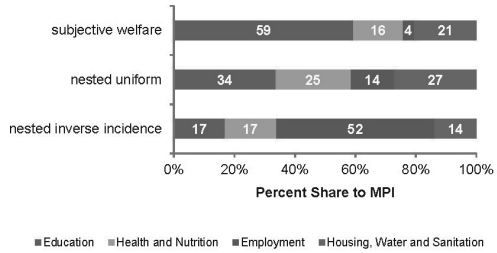


Region V

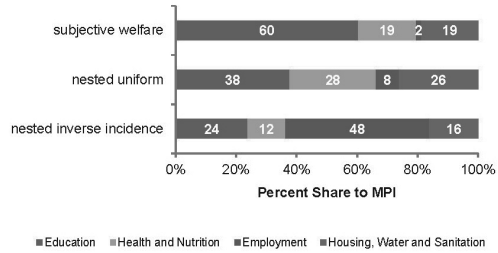


Appendix 5. Percent Share of each Dimension to MPI using 1/3 Poverty Cutoff by Weighing Scheme and Region: 2016 – cont'd.

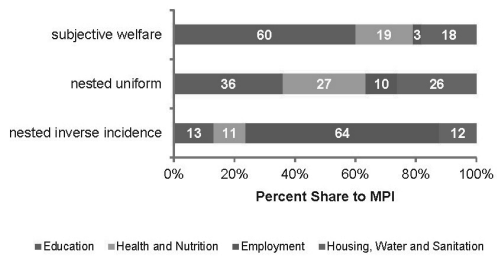
Region VI



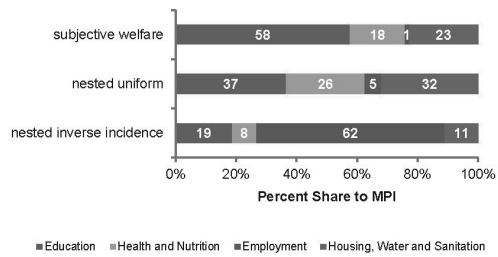
Region VII



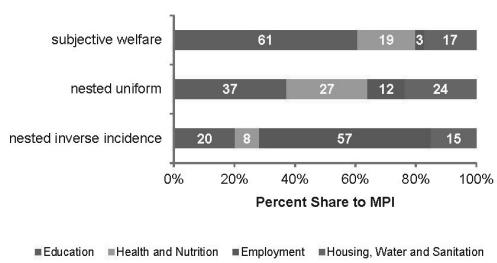
Region VIII



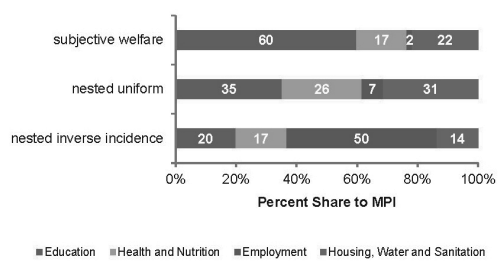
Region IX



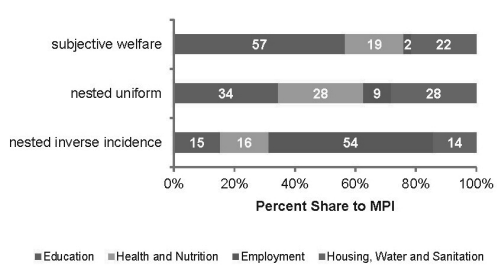
Region X



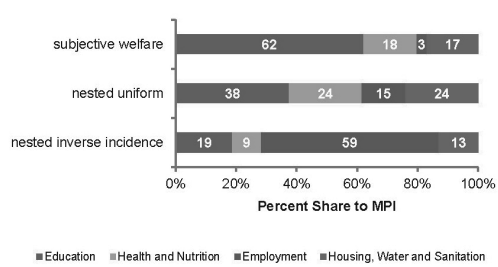
Region XI



Region XII

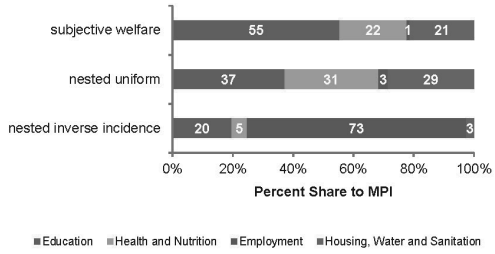


Caraga



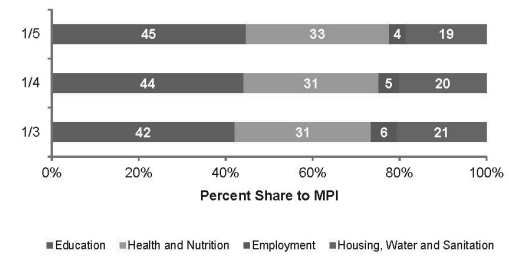
Appendix 5. Percent Share of each Dimension to MPI using 1/3 Poverty Cutoff by Weighing Scheme and Region: 2016 – cont'd.

ARMM

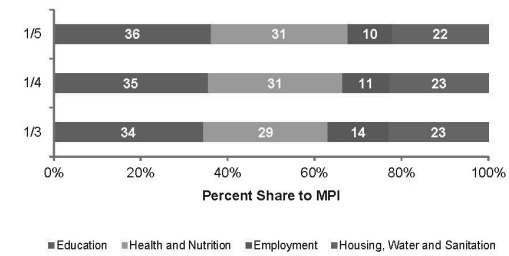


Appendix 6. Percent Share of each Dimension to MPI using 1/3 Nested Uniform Weights by Poverty Cut-off and Region: 2016

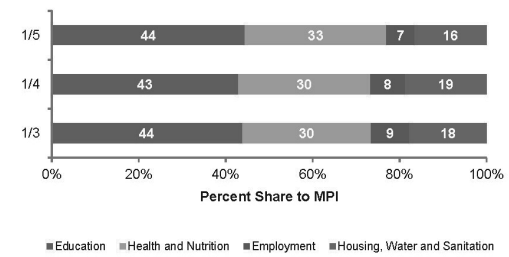
NCR



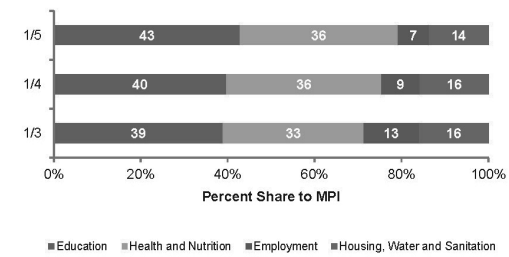
CAR



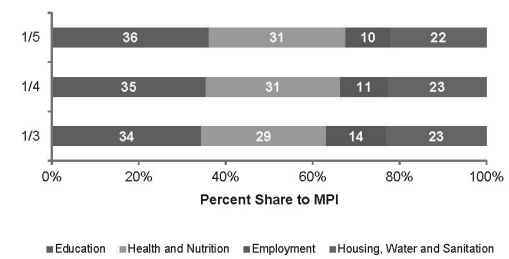
Region I



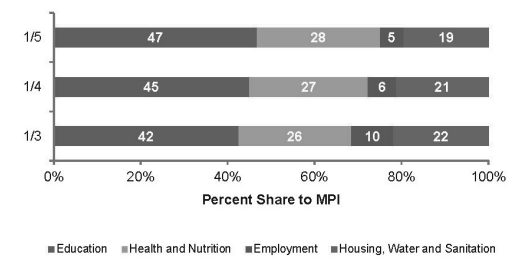
Region II



Region III

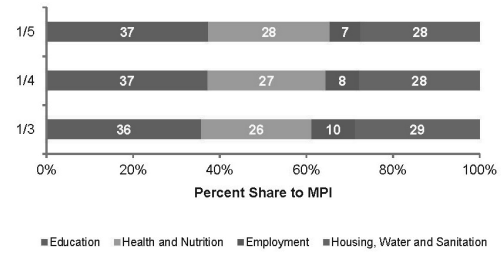


Region IVA

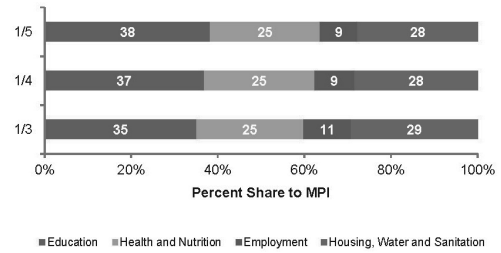


Appendix 6. Percent Share of each Dimension to MPI using 1/3 Nested Uniform Weights by Poverty Cutoff and Region: 2016 – cont'd.

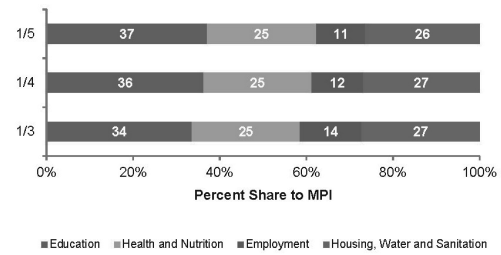
MIMAROPA



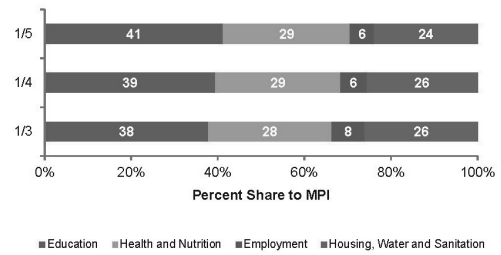
Region V



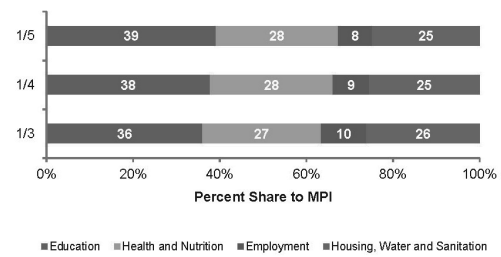
Region VI



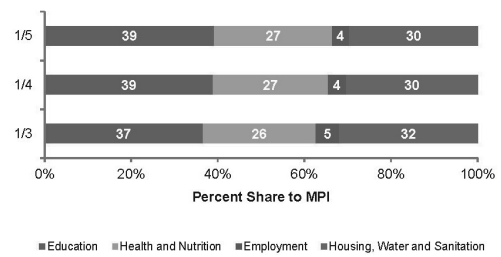
Region VII



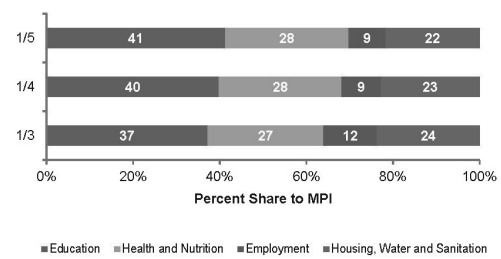
Region VIII



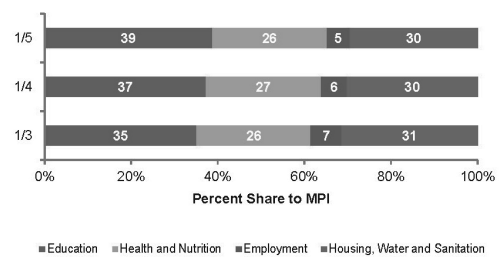
Region IX



Region X

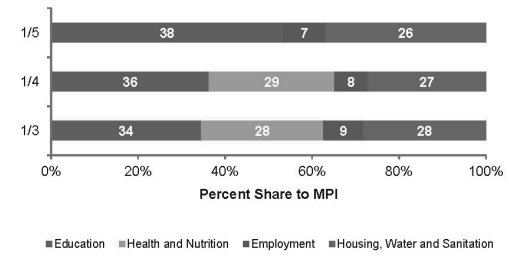


Region XI



Appendix 6. Percent Share of each Dimension to MPI using 1/3 Nested Uniform Weights by Poverty Cutoff and Region: 2016 – cont'd.

Region XII



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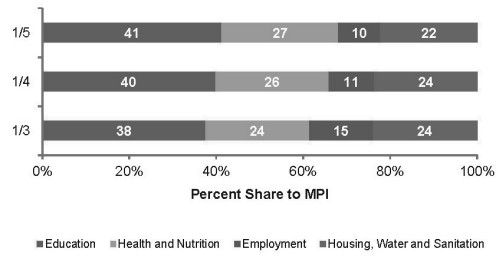

ARMM